Probabilistic Quantitative Precipitation Forecasts at the Weather Prediction Center

Frank Pereira
Forecaster
NOAA Weather Prediction Center (WPC)

With contributions from WPC staff

U.S. – Canada Virtual Border Conference
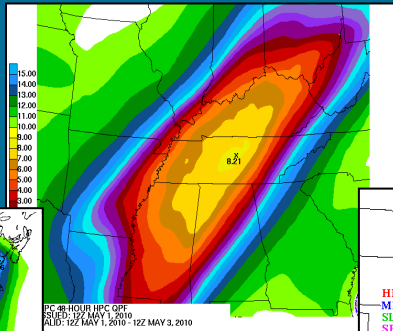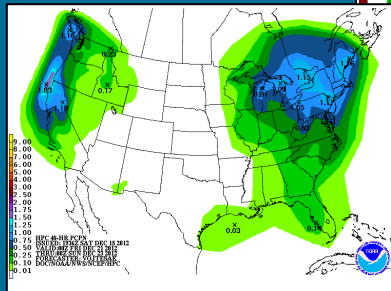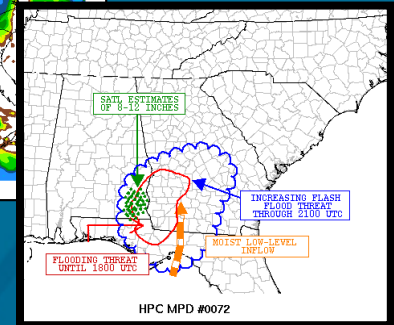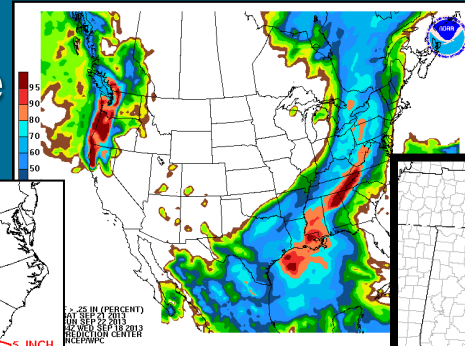25-26 September 2013
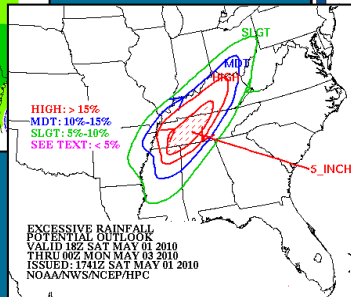
WPC QPF Services

Deterministic

Probabilistic

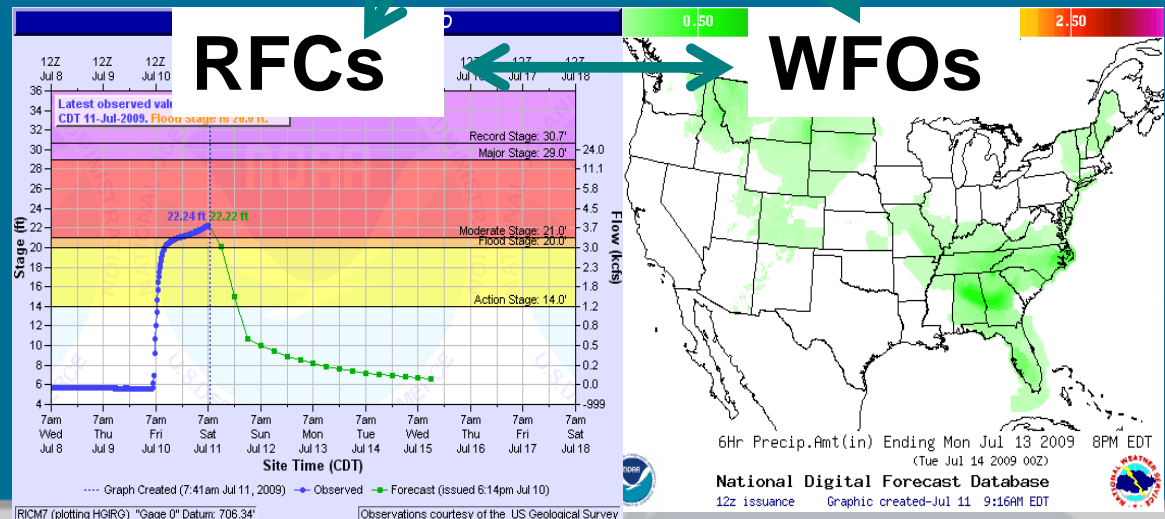Mesoscale Precipitation Discussion
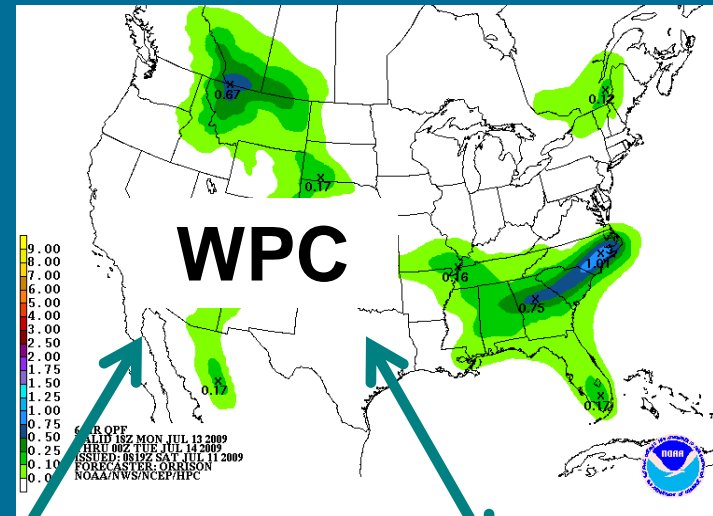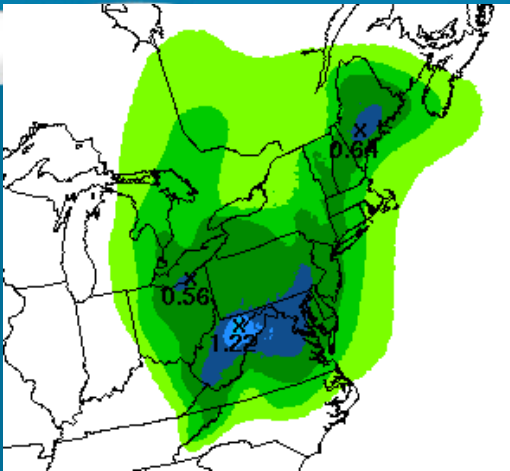
Excessive Rainfall

Days 1-7

1 Week ← forecast lead time → hours
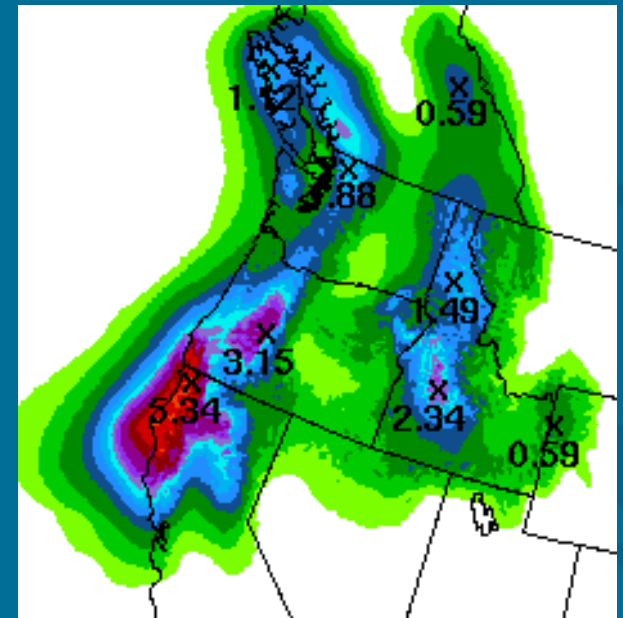
Deterministic QPF

- 6-hourly QPF to projection day seven (120-hrs)

- Graphical, gridded, kml

- QPF Discussion

WPC

RFCs

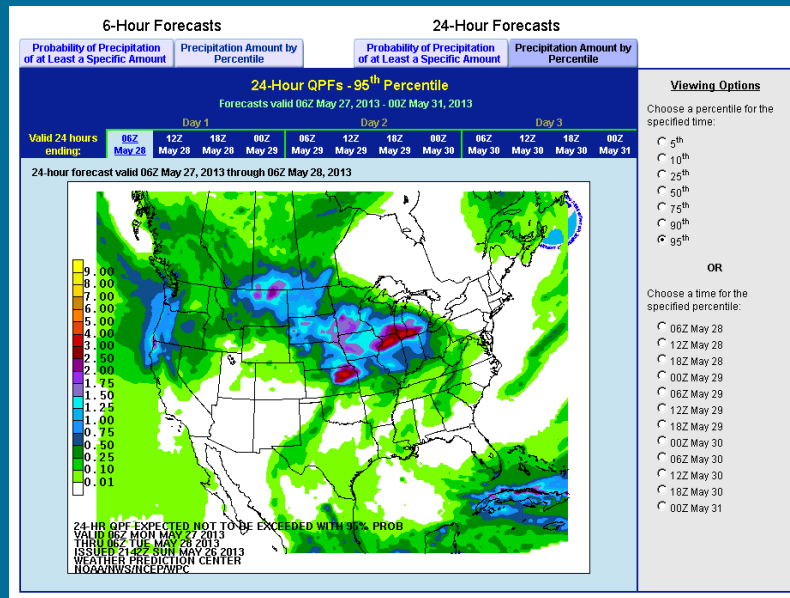**WFOs**

Deterministic QPF

- Forecast of areal average (does not necessarily capture maxima) for projection days one through seven
- Produced at 32-km resolution, but linearly interpolated to 5-km for NDFD
- Starting October 2013, downscaling to 5-km will use PRISM/climatological data which better captures complex terrain

Precipitation: September Climatology (1981-2010)

Precipitation (in.)

0	2.4–2.8
<0.1	2.8–3.2
0.1–0.2	3.2–4.0
0.2–0.4	4–5
0.4–0.6	5–6
0.6–0.8	6–8
0.8–1.2	8–12
1.2–1.6	12–16
1.6–2.0	16–20
2.0–2.4	20+

Copyright (c) 2012, PRISM Climate Group, Oregon State University
http://prism.oregonstate.edu - Map created Jul 10 2012
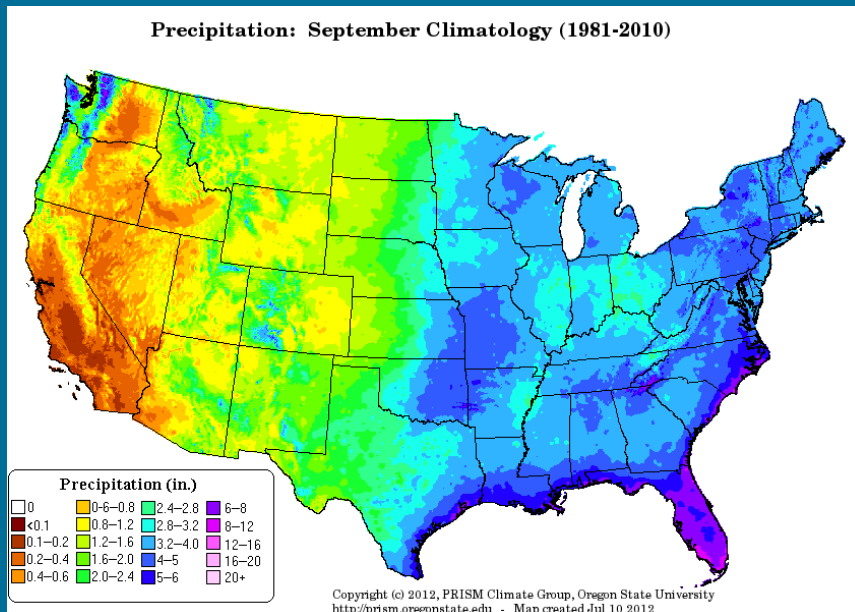
Probabilistic QPF

QPF by Percentile

5th, 10th, 25th, 50th, 75th, 90th & 95th percentiles

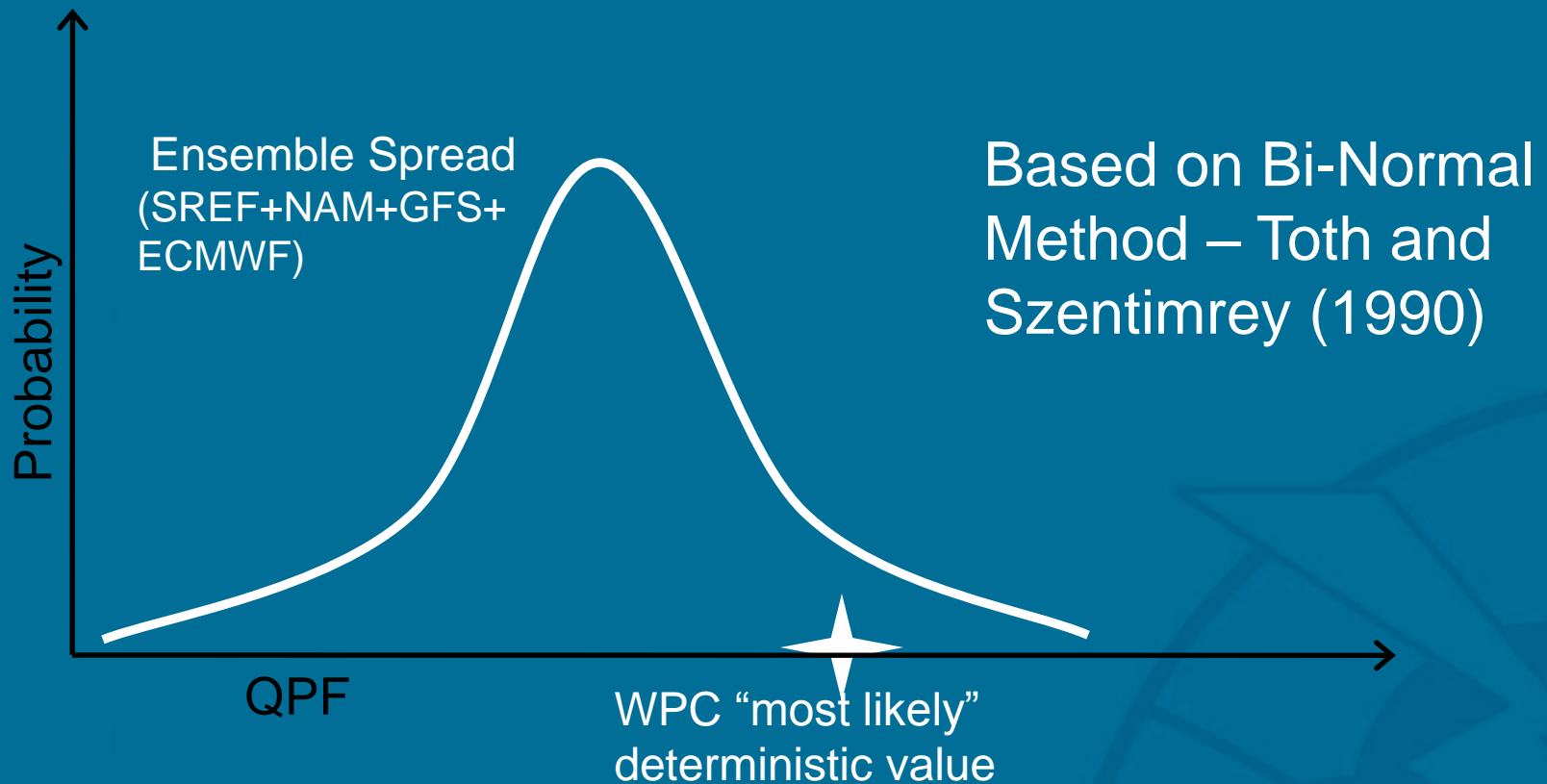## Probability for QPF Threshold Values
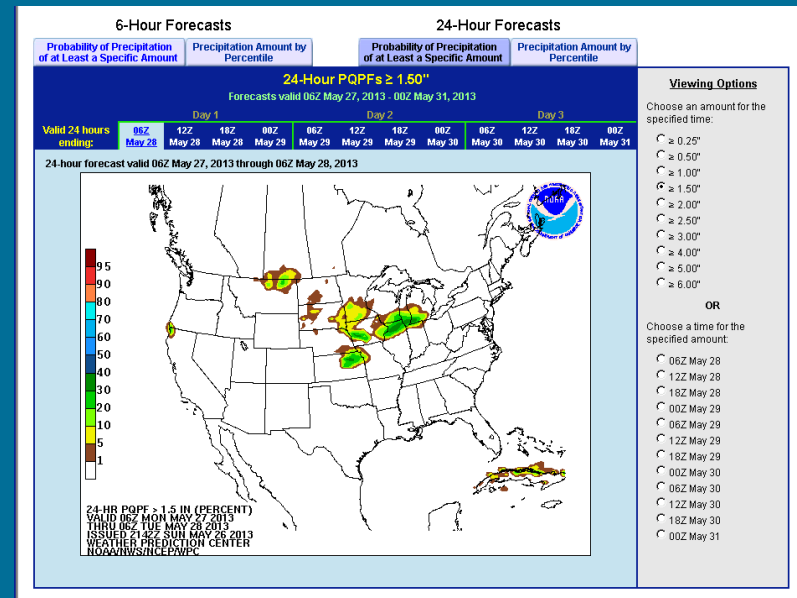
0.25-, 0.50-, 1.0-, 1.5-, 2.0-, 2.5-, 3.0-, 4.0-, 5.0- & 6.0-in thresholds

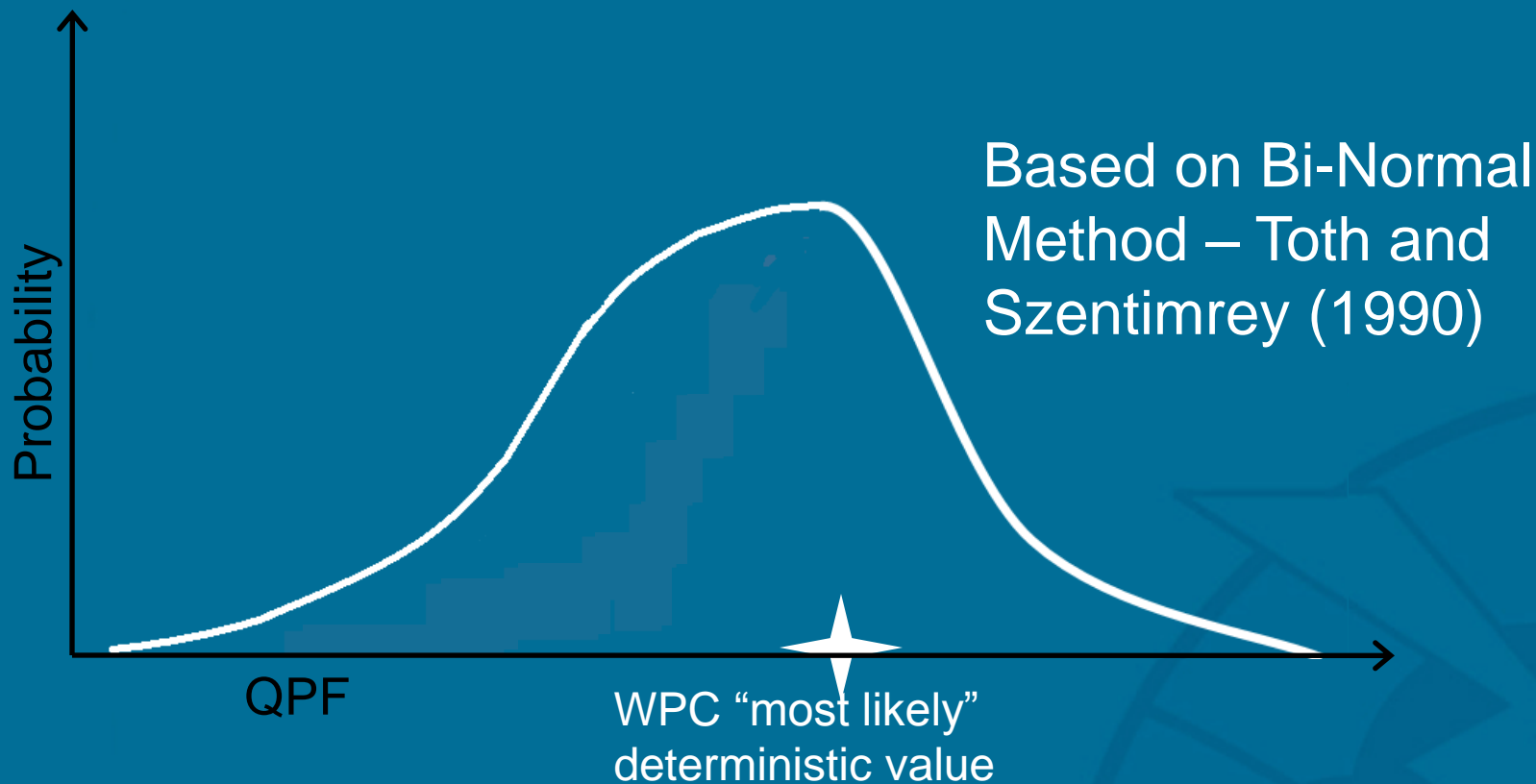6- and 24-hr increments for projection days one through three

WPC PQPF Method

Modifies ensemble distribution such that WPC deterministic QPF is the mode, while allowing skew

Ensemble Spread (SREF+NAM+GFS+ ECMWF)

Probability

QPF

WPC "most likely" deterministic value

Based on Bi-Normal Method – Toth and Szentimrey (1990)

WPC PQPF Method

Modifies ensemble distribution such that WPC deterministic QPF is the mode, while allowing skew

Based on Bi-Normal Method – Toth and Szentimrey (1990)

Probability

QPF

WPC "most likely" deterministic value

Case Examples

Colorado-New Mexico
September 2013

Southern Alberta
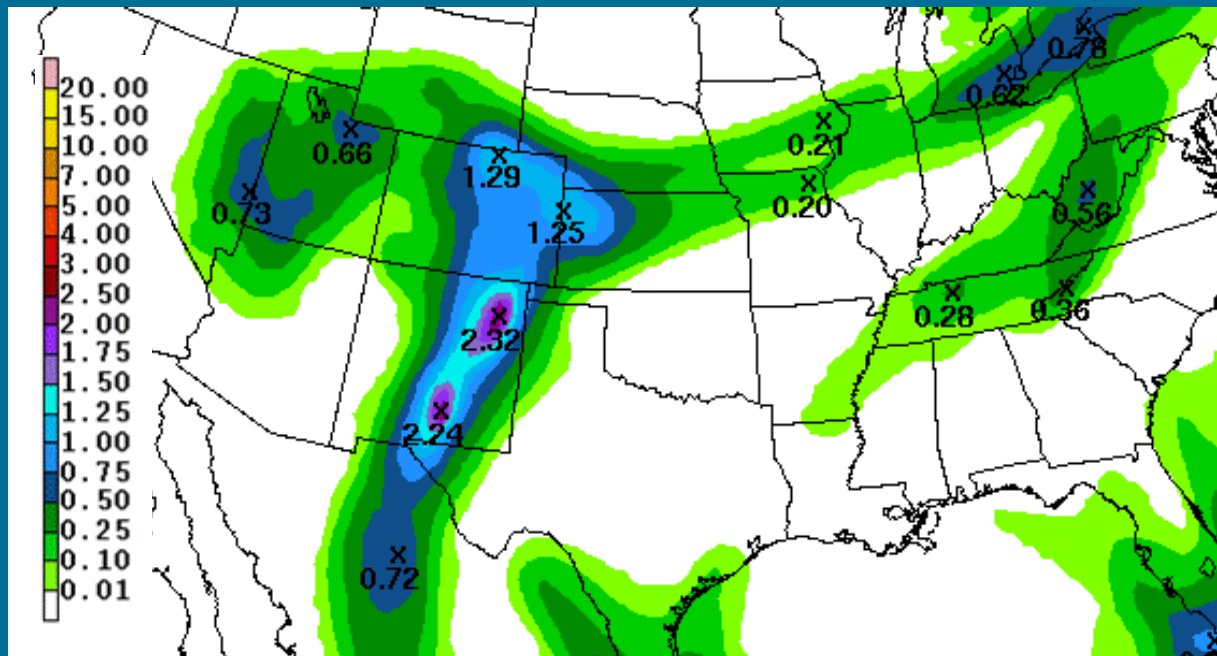June 2013

photo by Dan Brillon

photo by REUTERS/Andy Clark

Colorado-New Mexico
September 11-12, 2013

WPC Deterministic 24-hr QPF
Valid 12Z 12 September 2013
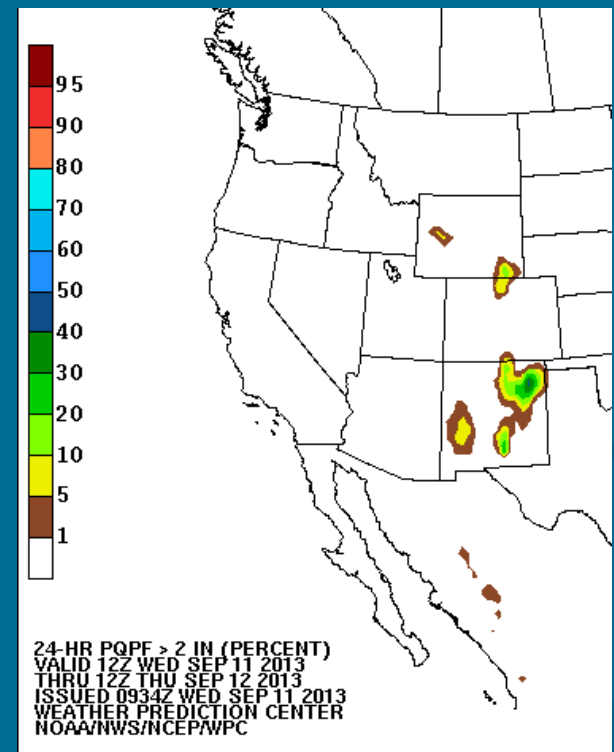

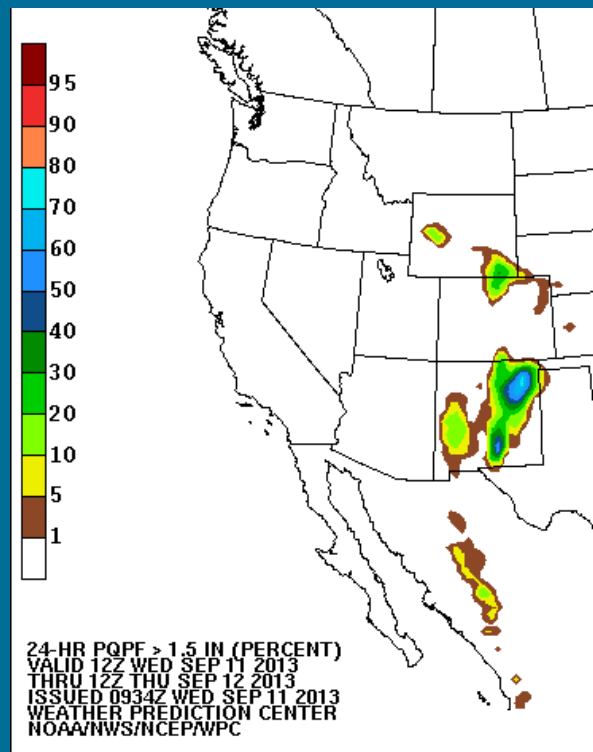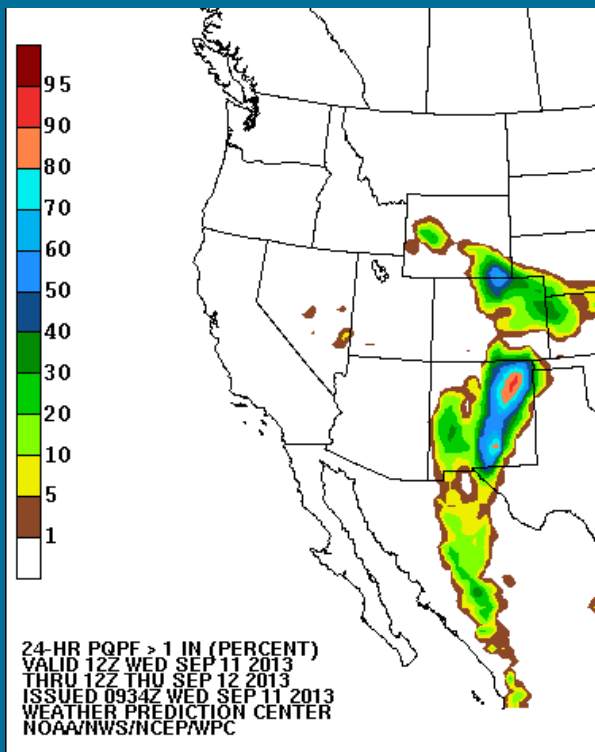Forecast 24-hrs

Colorado-New Mexico
September 11-12, 2013

24-hr PQPF > 1-in   24-hr PQPF > 1.5-in   24-hr PQPF > 2-in

12Z 11 September 2013 forecast 24-hrs

Colorado-New Mexico

September 11-12, 2013

10th percentile
(90% chance of exceeding)

25th percentile
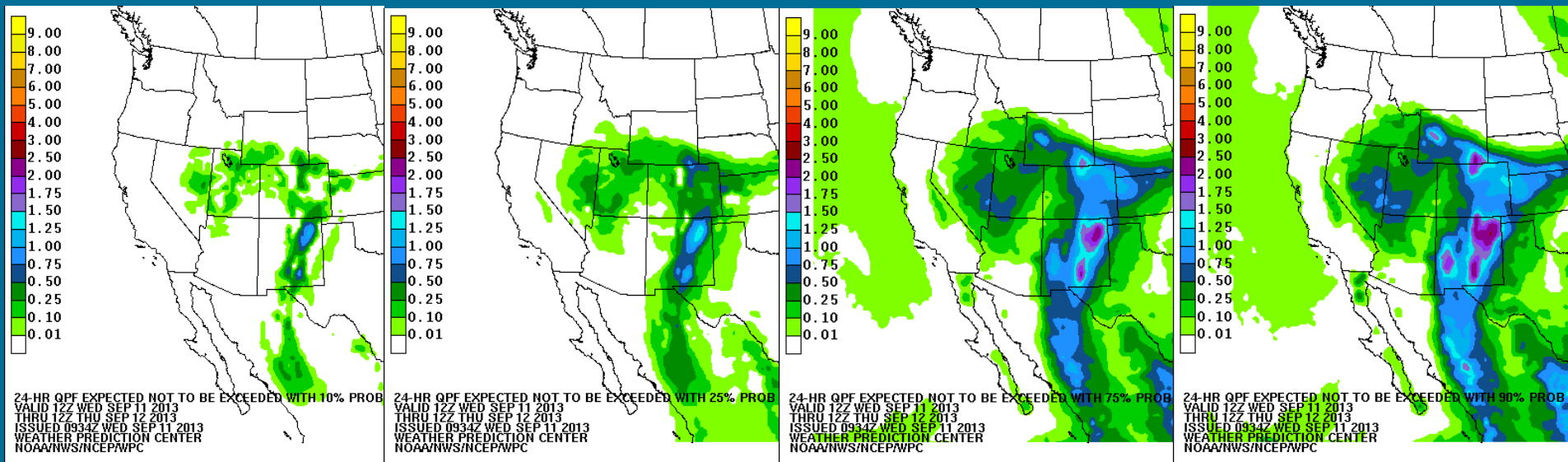(75% chance of exceeding)

75th percentile
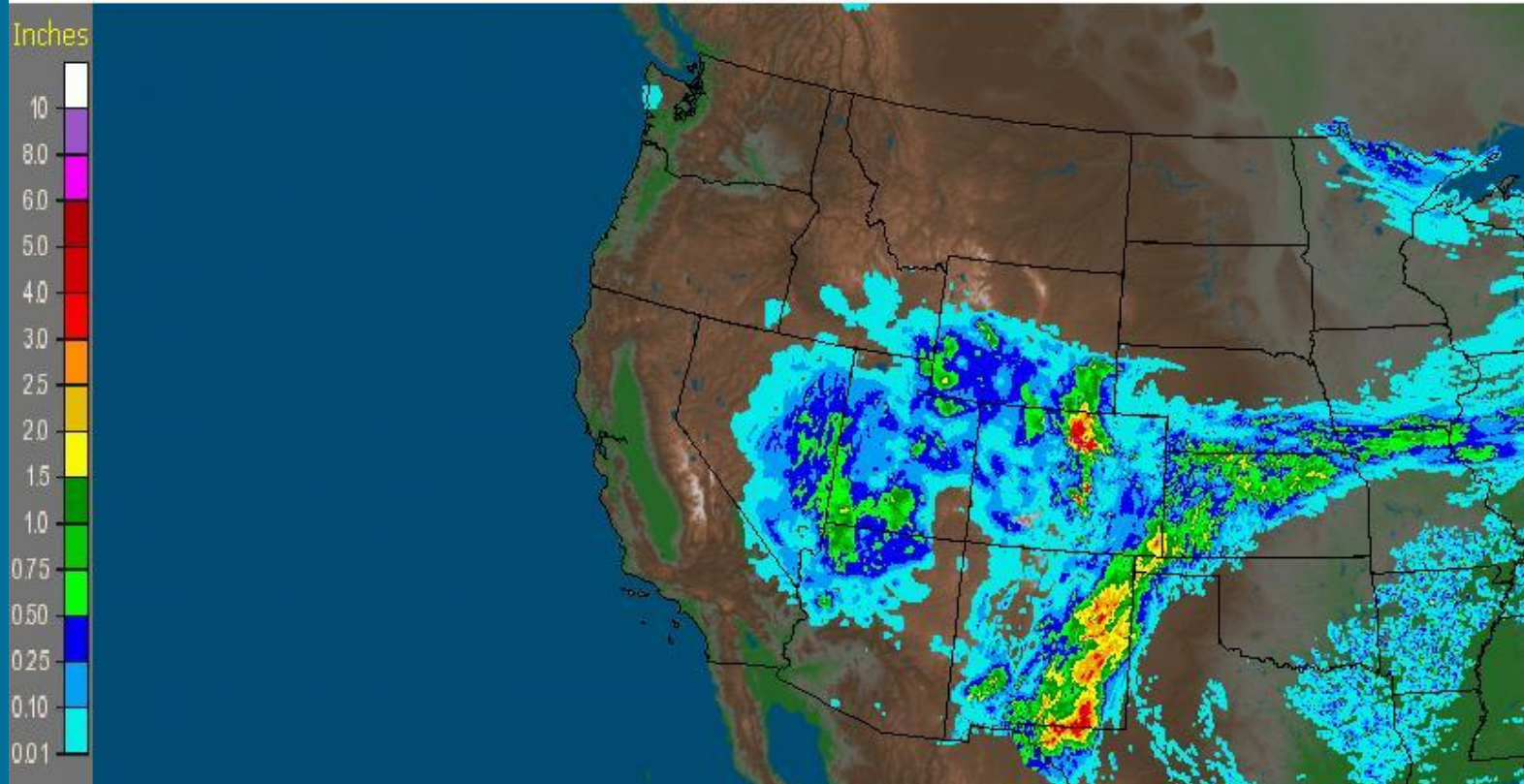(25% chance of exceeding)

95th percentile
(5% chance of exceeding)

12Z 11 September 2013 forecast 24-hrs

Colorado-New Mexico
September 11-12, 2013

NWS Western Region: 9/12/2013 1-Day Observed Precipitation
Valid at 9/12/2013 1200 UTC– Created 9/14/13 23:31 UTC
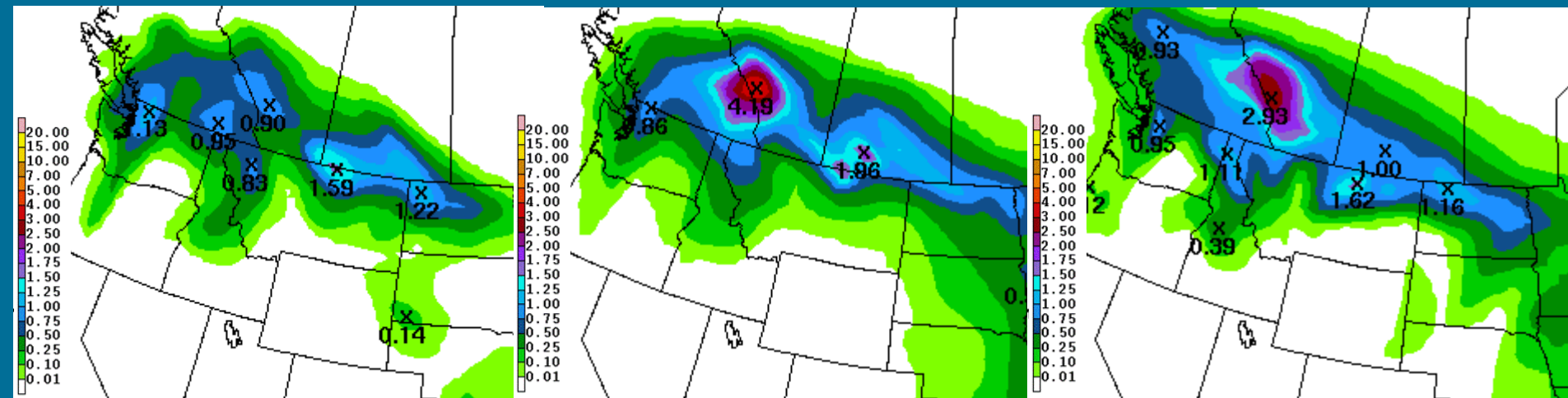
QPE Valid 12Z 12 September 2013

Southern Alberta
June 20-21, 2013

WPC Deterministic 24-hr QPFs
Valid 00Z 21 June 2013

Forecast 72-hrs   Forecast 48-hrs   Forecast 24-hrs
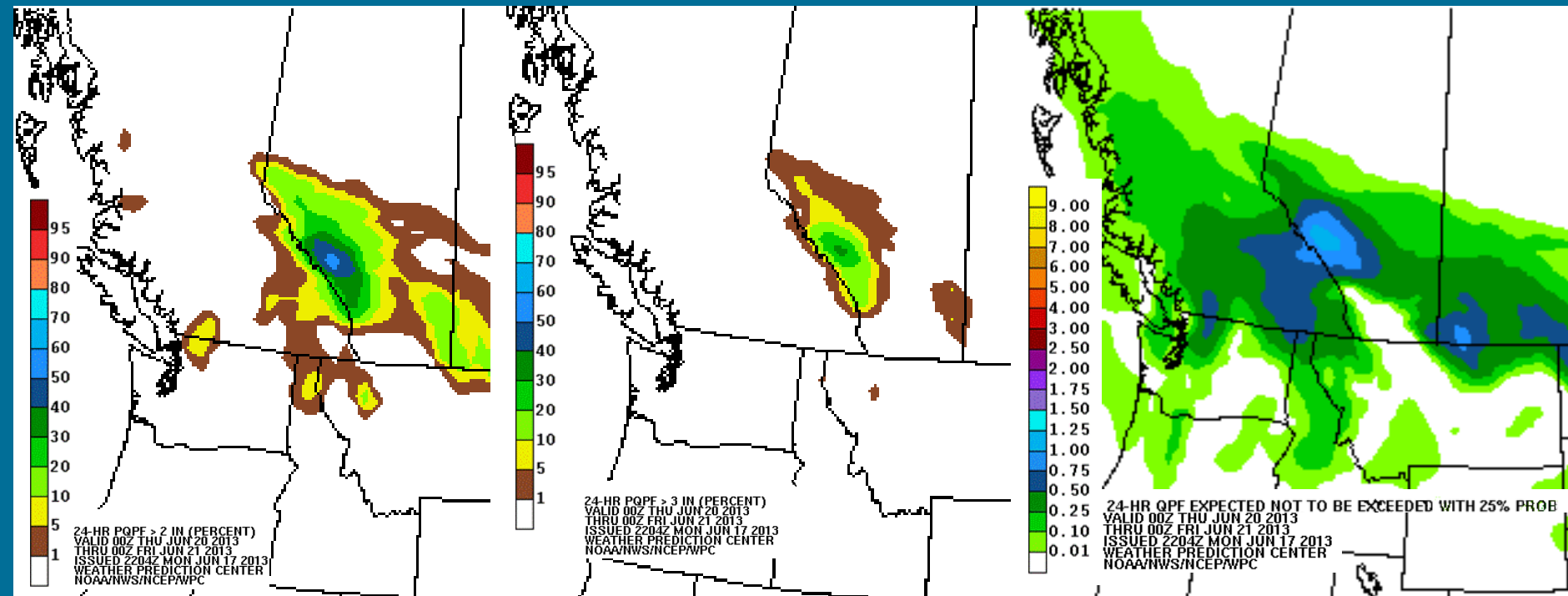
Southern Alberta
June 20-21, 2013

24-hr PQPF > 2-in   24-hr PQPF > 3-in   24-hr 25th percentile
(75% chance of exceeding)
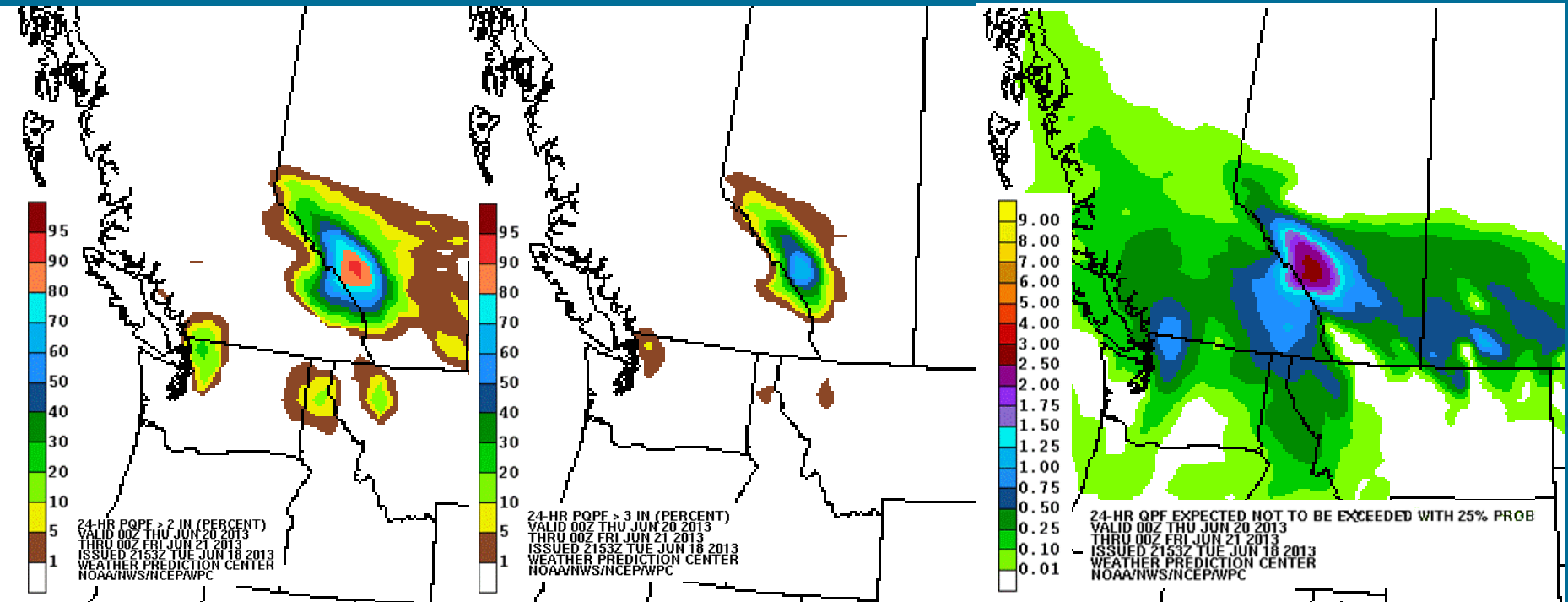

00Z 18 June 2013 forecast 72-hrs

Southern Alberta
June 20-21, 2013

24-hr PQPF > 2-in   24-hr PQPF > 3-in   24-hr 25th percentile
(75% chance of exceeding)
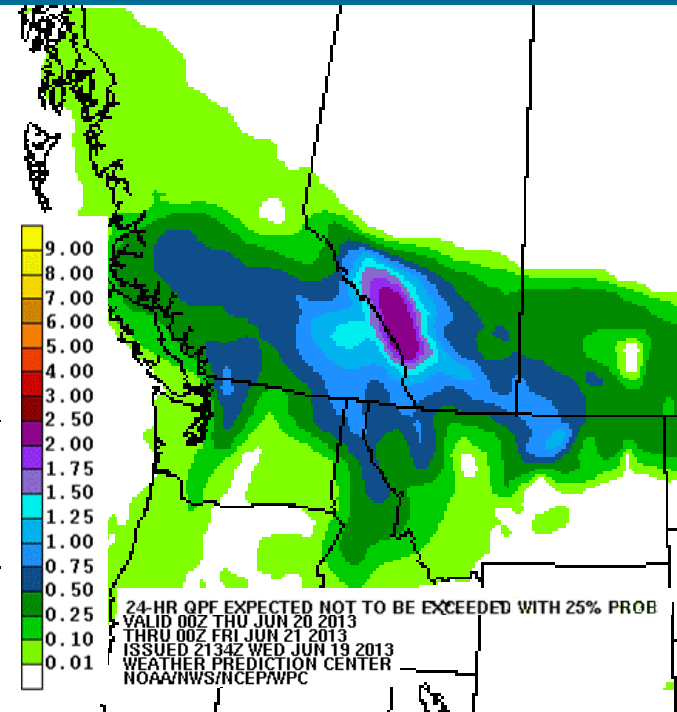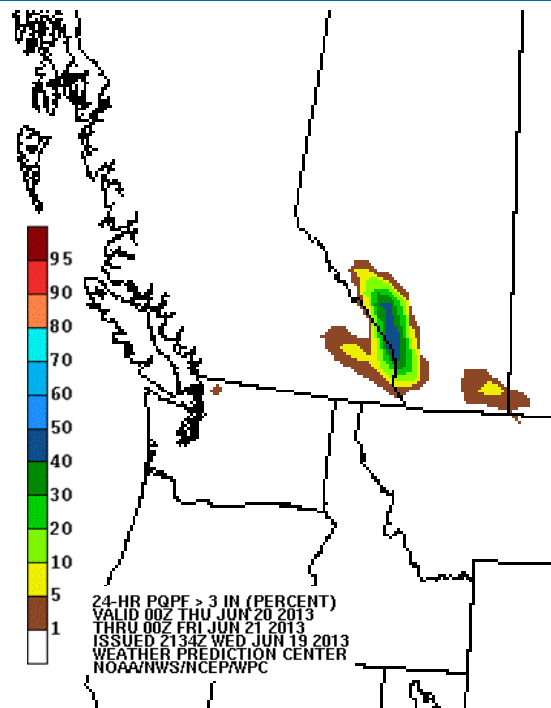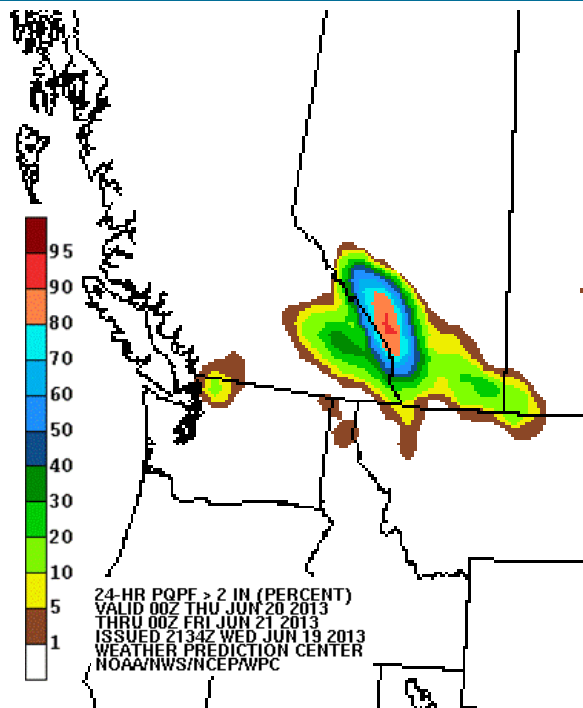
00Z 19 June 2013 forecast 48-hrs

Southern Alberta
June 20-21, 2013

24-hr PQPF > 2-in

24-hr PQPF > 3-in

24-hr 25th percentile
(75% chance of exceeding)

00Z 20 June 2013 forecast 24-hrs

Summary

- WPC deterministic QPF for forecast projection days one through seven available at – http://www.wpc.ncep.noaa.gov/qpf/qpf2.shtml

- WPC PQPF for forecast projection days one through three available at – http://www.wpc.ncep.noaa.gov/pqpf/conus_hpc_pqpf.php

- Questions? Email: Frank.Pereira@noaa.gov